

## BEETLES.

That class of insects which naturalists term *coleoptera*, and in common parlance are known by the name of beetles, seem to have been studied with more interest and care than most other entomological species spread over the globe.

The individual species of *scarabæi* may be divided into seven principal classes; of which the first, that of the *cetoniidae*, comprehends a series of beautiful insects, which feed on the juices of flowers. The golden beetle is one of the most charming; the country people call it the king of the beetles. It is of a golden green, with white spots; when it flies in the sun, scarcely raising the elytra, its whole body sparkles like polished metal. During the summer months, it lives in gardens, always choosing the most brilliantly colored flowers on which to rest; it penetrates to the heart of the roses and peonies, or settles on the petals of the honeysuckle, which it eats, sucking the honeyed liquid. It is perfectly inoffensive, does no harm to vegetation, and has not the unpleasant smell which belongs to many of the tribe. The females lay their eggs at the foot of trees among decayed wood, or even in the nests of ants. Here the young larvæ find their nourishment in woody morsels for three years, and then construct their cocoons, from which, in due time, the beetle emerges. One beautiful kind, found in the Philippine Islands, is so much admired by the ladies that they are kept as pets in small bamboo cages. The Brazilian species are of an immense size, and may be seen resting under the leaves of the maize plantations, or flying round the tops of the tallest trees. These, again, are surpassed in size by the Goliath, which is peculiar to tropical Africa. Collectors have been so anxious for specimens, and found them so difficult to obtain, that as much as fifty pounds has been given for one of these insects, which are the common food of the natives, when roasted.

The sacred beetle of the Egyptians belongs to the *coprinae*; its singular instincts had, without doubt, much astonished them, for it is found on the most ancient monuments in the land of the Pharaohs, depicted on amulets, placed on sarcophagi, and treated with the greatest veneration by the dwellers on the banks of the Nile. They were an agricultural people, and valued these great black insects for their habit of clearing away noxious substances. An oily substance which they secrete keeps their skins bright and glossy, so that none of the dirty matter among which they live can adhere to them. The fore feet are armed with spines, whilst the hind ones are much longer and suited for the work they have to perform. The care which the female takes for the preservation of its eggs and the development of its larvæ is very curious. Instead of simply hiding them, like other beetles, in a lump of mud or some little cavity where the egg is laid, she surrounds it with manure, and rolls it up into a little ball with her hind legs; soon it is a solid, well kneaded mass, with the egg in the center. Already a choice has been made of a suitable place where the larvæ, when hatched, can find a living. Towards this point she sets out, rolling the ball before her; meeting with some obstacle, or a rough piece of ground, she places the lump on her broad head, and thus carries it over. But should it prove insurmountable, she flies off to seek other aid, and soon returns with five or six others, who assist her by pushing on all sides, and thus carry the precious burden to its destination. Then the hole must be dug in which to deposit it—the fore legs now come into play, being especially formed for spades,—and when it is deep enough, the ball is rolled in, the hind legs brush down the earth, and every trace of the hole disappears under the parent's indefatigable labor.

Among the class of the *melobonthidae*, the common cockchafer may be regarded as the type of the whole, and a very redoubtable enemy it can prove itself to be. In some years, it appears during the month of April in prodigious numbers; its life lasts until June; and during all this time it is preying on the leaves of various trees,—the maple, poplar, birch, beech, and oak. But it shows a marked preference for the elm, so that in France the peasants call the flowering and fruit buds "cockchafer's bread." It is not uncommon to see whole forests on the Continent entirely bare of leaves in the spring months, having been eaten up by these insects. But this is a slight evil compared with what they have already effected underground, by living on the roots of cereals. The various metamorphoses of the insect in its underground life last for three years, during all which time it displays a wonderful voracity. When the females are ready to lay their eggs, they choose a light, well cultivated soil, and, burying themselves in it, perform their task. There are generally about forty young ones, which burst the shell in thirty days. Nature has armed them with powerful mandibles and a forked tooth, so that they set to work at once.

After a warm day, when they have been tempted nearer the surface, whole fields, covered with green shoots, are at once changed into dried-up withered leaves and stems. The roots of the vegetables, grain, or colza, have been eaten and soon perish by the same means. For this reason, the habits of this kind of beetle have been made a peculiar study on the Continent, especially where their ravages are so much dreaded.

When the ground is in course of preparation for receiving the seed, in the months of September and October, almost all the larvæ are near the surface; taking care not to plow the ground too deeply, they will, in most cases, be turned up, and the harrow, energetically used, will destroy the greater number; if, however, the plow is too deep, they will only be buried.

The Sexton beetles are well known throughout Europe, and are so called from their living on the bodies of any animal they can find. Should a dead mouse or mole be left in a

field, they collect in large numbers around it; and as their intention is to lay their eggs in it, and so provide suitable food for the larvæ, they proceed to bury it, that it may not dry up or be eaten by other animals. Hollowing the ground beneath and throwing out the earth, the animal gradually sinks down and is covered with the surrounding soil. About twenty-four hours suffice to conceal a mouse. The eggs are speedily laid, and the larvæ feed upon the putrid flesh until they are full grown, when they descend into the earth for three or four feet and undergo their metamorphoses. There is a very curious tribe found in Brazil, the body being immensely distended and lying on the top of the back. They are generally found in the nests of the white ants, and do not lay eggs, but produce living larvæ. The Bombardier beetles derive their name from the apparatus of defence with which they are provided. Their habit is to hide under stones in large numbers, and when the stones are disturbed, they eject a quantity of vaporous fluid with a loud noise; it is pungent, acrid, and volatile, becoming a bluish vapor when mixed with the air. Chemical tests prove it to be a strong acid, which will produce a sense of burning on the skin.

It is to the family of beetles that the *cantharides* belong, which have been used by the medical profession from the days of Hippocrates and Aretæus. Not unlike them in appearance are the pretty glowworms, which light up the grassy banks of our southern hedgerows during the summer nights. It is the female only that possesses the phosphorescent light, which it can withdraw at pleasure; and it is not furnished with wings, so that its appearance is more like that of a larva than a beetle. Some species find their home in timber or planks, instead of the ground. Every one knows the small holes which are seen to be drilled through the wooden floors of old houses: these are made when the larvæ change into beetles; and as they are nocturnal in their habits, they discover their whereabouts to their companions by striking their mandibles against the wood. From this simple noise has arisen the superstitious dread of invalids and nurses, who, in the dead of the night, hear the death watch, and consider it as a summons to another world. Elm trees suffer greatly from the attacks of a beetle of this class, whole forests being sometimes laid low under its insidious labors. The female makes a gallery beneath the bark, and, boring side alleys, lays an egg in each; when hatched, the young ones eat away in regular directions until the whole tree is pierced. In tropical countries, the larvæ are of a much larger size, and their ravages are more serious. The Titan, which is found in Guiana, revels in the undergrowth of that hot, damp district, where vegetation is exuberant; and the mimosa trees in the West Indies have their young shoots destroyed by a *lamia*. M. Houliet, who once lived in the neighborhood of Rio Janeiro, heard the sound of falling branches of trees belonging to the *acacia* every night. On examination, he found they were sawn all round, but the pith was left untouched, so that they broke from their own weight when the wind blew upon them. It was supposed to arise from the mischief of the slaves; but on cutting into the branch, the larvæ of the *oncideres* were found, and the beetle had, no doubt, cut round with its powerful jaws, to prevent the sap flowing in, which would interfere with the growth of its young.

In such a numerous family, only the most curious examples have been selected; but we may just mention the ladybirds as belonging to it, as they are such favorites with little children. These pretty insects are common in all quarters of the globe, and are very valuable in checking the swarms of insects which infest roses and other plants. It is not in the adult state that they eat much; but the gray larvæ may be seen creeping up the stems, and swallowing the lice in regular order. During the last few years, immense numbers have appeared in the south of England, and have been described as extending in dense masses for miles. In conclusion it may be said that the uses and instincts of beetles are most wonderful. Plants grow too fast, and the larvæ settle on them; with wonderful appetite, they eat incessantly, and make haste to reach their full size. They fertilize the soil by scattering decomposing matters, and thus prevent them from vitiating the air; while their gorgeous colors compete with those of the floral world and add to the charms which Nature offers to the observer.

## Mineral Sperm Oil.

This is a burning heavy oil made from petroleum; and its valuable properties as a safe illuminating agent are such as to render this product one of very great importance. The following statement of its discovery and character is given by Mr. Joshua Merrill:

"In the summer of 1869, in connection with Mr. Rufus S. Merrill, I made an important discovery relating to burning heavy or paraffin oil in lamps, for illuminating purposes. Mr. R. S. Merrill is a skillful mechanic who has devoted himself for several years to perfecting the construction of lamps and burners for hydrocarbon oils. While experimenting upon an apparatus for burning paraffin wax, with a view to increase the light from this beautiful substance over that obtained from common candles—the only form in which paraffin is burned—he one day put some lubricating oil into the lamp, instead of the paraffin wax, and we were both much surprised at the good qualities of the light yielded by it. But, after experimenting some days, we found this heavy oil to be impracticable as an illuminating material in its present form, and that some modification would be necessary. It occurred to me that if this heavy paraffin oil was passed through a partially destructive distillation, cracking it enough to lessen its viscosity but not enough to render it volatile, its increased mobility would cause it to ascend the wicks freely, and yet preserve its character as a fixed oil.

"After many trials, I obtained the product now called 'mineral sperm oil,' which is sufficiently thin to fill the wicks perfectly; but it is so far from being a volatile oil that it is comparatively odorless, and will not take fire at any temperature below 300° Fahr., or nearly 100° hotter than boiling water. Flames of considerable size, such as a large ball of wicking yarn saturated with oil and ignited, when plunged beneath the surface of this oil, previously heated to the temperature of boiling water, are extinguished at once. It burns freely in the German student lamps, and with great brilliancy from the 'Dual' burner."

The manufacture of this oil is patented in this country and in Great Britain; and Mr. Merrill estimates the quantity that may be made as at least one quarter of the whole production of petroleum, or 160,000 gallons of the mineral sperm oil every day—a quantity more than twice that of the whale and sperm oils, obtained in the best days of the whale fishery of this country.

The present time, when government authorities and scientific men are so generally cautioning against the "dangers of kerosene," and just as French *savans* have discovered that certain heavy petroleum oils may be burned in lamps, seems peculiarly opportune for the introduction of this product of American skill and invention—namely, a hydrocarbon, or a mixture of hydrocarbons, which seems to fulfil all the requirements of an oil to be burned in lamps, yielding a steady, brilliant, and safe light. And practical indications of its appreciation may be found in the manufacturer's announcement that the demands for this mineral sperm oil are steadily increasing. It is used on ocean steamers plying between the United States and Europe, and also on several railroads.

## Metal Coated Sheet Iron.

An improved method of protecting iron from injury and deterioration has been introduced by Mr. B. Morrison of Philadelphia, whose invention consists in deoxidizing the scale oxide adherent to sheet iron, and amalgamating, blending, or intimately uniting with it any of the softer and more fusible metals, so as to render such scale oxide more flexible, soft, adherent, and less liable to rust, and the sheet iron also more perfectly annealed and flexible. It is essential that the sheets be made of the best charcoal bloom iron, and that the scale oxide thereon be even, or of uniform thickness and unbroken; and in order to produce such a scale oxide, it is recommended that the usual rough and imperfect scale be removed—by means of a weak acid, in the usual manner practiced in the process of coating sheet iron with zinc by immersion—and that the sheets be then passed between a pair of smooth pressure rolls, and finally subjected to a sufficient heat to produce thereon a new and uniform scale of oxide.

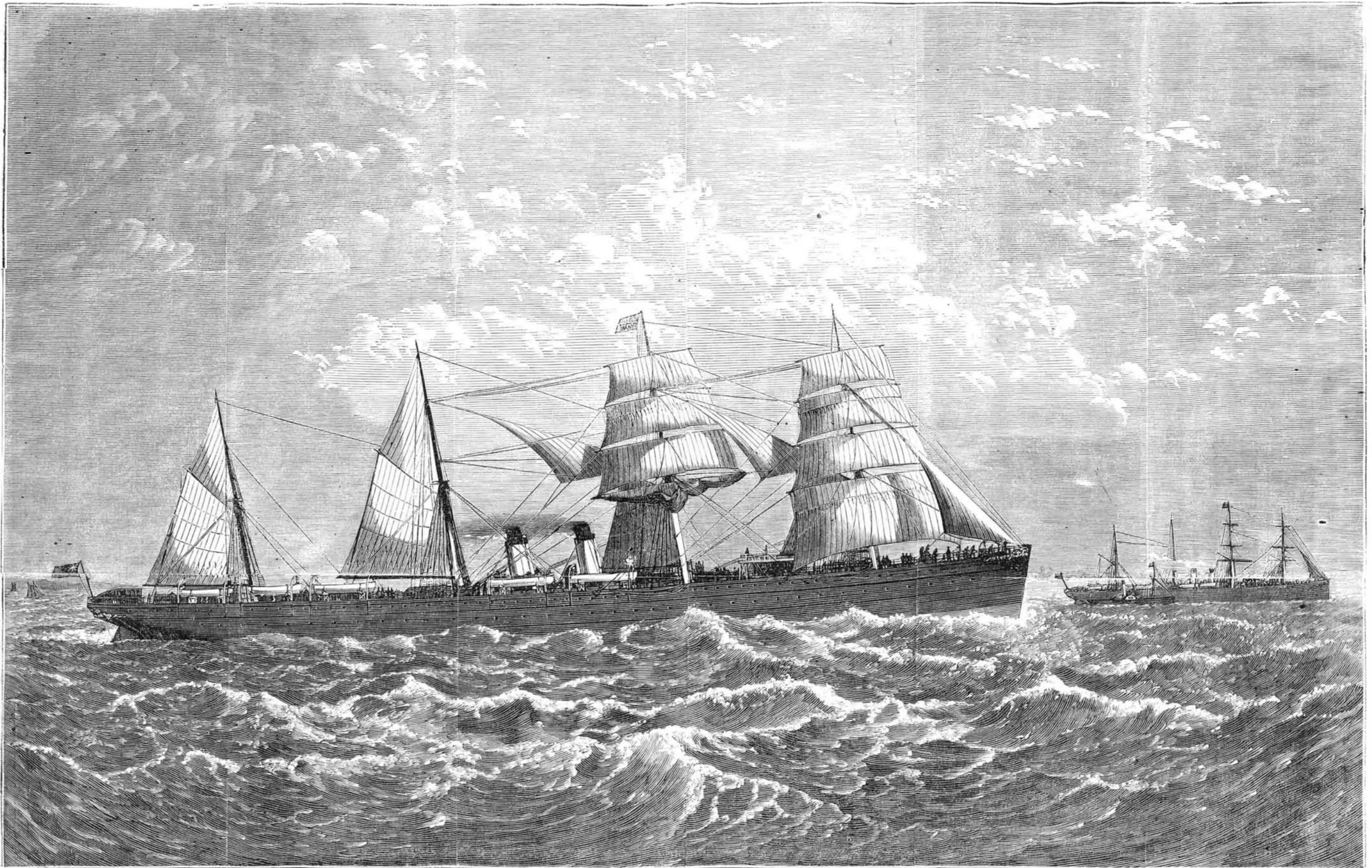
Having prepared saturated or strong aqueous solutions (say) of sulphate of zinc, chloride of zinc, chloride of tin, acetate of zinc, acetate of lead, and of any other readily fusible metal that will amalgamate, unite, or combine with the deoxidized scale on the iron at a strong or bright red heat under the hydrogen or carburetted hydrogen gas, immerse the deoxidized sheets in either one or a mixture of two or more of the said solutions for five or ten minutes, or apply the same by rubbing it on by means of a sponge or rough brush; let the excess of solution drain off, and the remainder crystallize or dry upon the surface of the sheets. Now place them in a box in the heated chamber of a furnace; then introduce the hydrogen gas, and slowly heat up to a scarcely visible red, maintaining the said low heat for (say) half an hour, more or less, to allow a perfect reduction of the oxide of the applied solution; after which the heat should be increased to a bright red, or heat a few degrees above that which may be required to fuse the now reduced softer metal and cause the same to amalgamate, blend, or unite with the deoxidized and, consequently, soft and porous scale on the sheet iron.

To obtain brightness of surface when desired, it is proposed to pass the sheets severally between and in contact with a pair of cylindrical rapidly rotating bristle brushes; and, if afterward intended to be put up in packs for storage or shipment, the sheets may, as a further protection against dampness, be dipped into any suitable hydrocarbon oil, and then the superfluous portion drained or wiped off. The solution of the sulphate or of the acetate of zinc forms, with the deoxidized scale on the iron, an excellent coating. About three parts of the solution of chloride of zinc mixed with two parts of the solution of chloride of tin make, with the deoxidized scale on the iron, an excellent flexible coating of a whiter color. Three parts of the solution of the acetate of zinc, mixed with two parts of the solution of the acetate of lead and one part of solution of the chloride of tin, make, with the deoxidized scale on the iron, a very suitable coating for sheet iron intended to be used in the construction of stoves, stove pipes, coal hods, etc.; but as the predominant metal in the coating is the deoxidized scale oxide of iron, the number and proportions of solutions of whatever metals are intended to be applied thereto may be increased and varied as the coating desired may require.

## Germination—Its Relation to Light.

The theory of the germination of plants, which has been heretofore admitted, requires that the germinating seed be excluded from direct sunlight. Late experiments appear to establish the fact that, while exclusion from the luminous rays of the solar spectrum is necessary to the healthy germination of seeds, yet the chemical or actinic rays are indispensable to that process. These penetrate much deeper into the soil than do the luminous rays. The exclusion of the chemical rays, and not the absence of oxygen alone, is assumed to be the cause of seeds failing to grow when buried too deeply in the earth. Will our agricultural colleges settle this question by careful experiments? Let us have all that can be known of the mysteries of plant life.





THE NATIONAL STEAMSHIP COMPANY'S STEAMER "EGYPT."—[See Page 364.]